

CLAIMS

- (1) A method for forming a silicon film comprising applying by patterning an ink composition containing a silicon compound onto a substrate by an ink jet process.

5 (2) A method for forming a silicon film according to claim 1, wherein the ink composition is applied in an inert atmosphere.

10 (3) A method for forming a silicon film according to either claim 1 or 2, further comprising, after applying the ink composition containing the silicon compound onto the substrate by the ink jet process, a drying step of removing a solvent of the composition and a step of pyrolyzing and/or photolyzing in the coating film.

15 (4) A method for forming a silicon film according to claim 3, further comprising a step for irradiating the silicon film formed by the heat treatment and/or the light treatment with laser to convert the amorphous silicon film into a polycrystalline silicon film.

(5) A method for forming a silicon film according to claim 1, wherein the silicon compound is a silicon compound represented by the following general formula (I):

Si_nX_m / (I)

wherein n represents an integer 3 or more, m represents an integer of n, 2n-2, 2n, or 2n+2, and X represents a hydrogen atom and/or a halogen atom.

20 (6) A method for forming a silicon film according to claim 1, wherein the silicon compound is a silicon compound represented by the following general formula (II):

$$\text{Si}_a\text{X}_b\text{Y}_c \quad / \quad (\text{II})$$

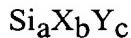
wherein X represents a hydrogen atom and/or a halogen atom, Y represents a boron atom or a phosphorus atom, a represents an integer of 3 or more, b represents an integer of a to $2a+c+2$, and c represents an integer of 1 to a.

(7) A method for forming a silicon film according to claim 1, wherein the silicon compound is a composition containing a silicon compound represented by the following general formula (I) and a silicon compound represented by the following general formula (II):



(I)

wherein n represents an integer 3 or more, m represents an integer of n, 2n-2, 2n, or 2n+2, and X represents a hydrogen atom and/or a halogen atom;



(II)

5 wherein X represents a hydrogen atom and/or a halogen atom, Y represents a boron atom or a phosphorus atom, a represents an integer of 3 or more, b represents an integer of a to 2a+c+2, and c represents an integer of 1 to a.

(8) A method for forming a silicon film according to either claim 5 or 7, wherein n is in a range of 5 to 20 in the general formula (I).

(9) A method for forming a silicon film according to either claim 6 or 7, wherein a+c is in a range of 5 to 20 in the general formula (II).

(10) A method for forming a silicon film according to any one of claims 1 to 9, wherein, in the composition, the silicon compound is dissolved in at least one solvent having a vapor pressure at room temperature of 0.001 to 50 mmHg.

15 (11) A method for forming a silicon film according to claim 10, wherein the solvent is a hydrocarbon solvent.

(12) A method for forming a silicon film according to any one of claims 1 to 11, wherein the concentration of the silicon compound in the composition is in a range of 0.01 to 10 percent by weight.

20 (13) A method for forming a silicon film according to any one of claims 1 to 12, wherein the concentration has a viscosity of 1 to 50 mPa·s and a surface tension of 20 to 70 dyn/cm.

(14) An ink-jet ink composition for forming a silicon film, comprising a silicon compound represented by the general formula (I):

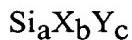


wherein n represents an integer 3 or more, m represents an integer of n, 2n-2, 2n, or 2n+2, and X represents a hydrogen atom and/or a halogen atom.

(15) An ink-jet ink composition for forming a silicon film, comprising a silicon compound represented by the general formula (II):

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(II)

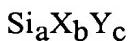
wherein X represents a hydrogen atom and/or a halogen atom, Y represents a boron atom or a phosphorus atom, a represents an integer of 3 or more, b represents an integer of a to $2a+c+2$, and c represents an integer of 1 to a.

- 5 (16) An ink-jet ink composition for forming a silicon film, comprising a silicon compound represented by the following general formula (I) and a silicon compound represented by the following general formula (II):



(I)

wherein n represents an integer 3 or more, m represents an integer of n, $2n-2$, $2n$, or $2n+2$, and X represents a hydrogen atom and/or a halogen atom;



(II)

wherein X represents a hydrogen atom and/or a halogen atom, Y represents a boron atom or a phosphorus atom, a represents an integer of 3 or more, b represents an integer of a to $2a+c+2$, and c represents an integer of 1 to a.

- 15 (17) An ink composition according to either claim 14 or 16, wherein n is in a range of 5 to 20 in the general formula (I).

(18) An ink composition according to either claim 15 or 16, wherein a+c is in a range of 5 to 20 in the general formula (II).

- 20 (19) An ink composition according to any one of claims 14 to 18, wherein the silicon compound is dissolved in at least one solvent having a vapor pressure at room temperature of 0.001 to 50 mmHg.

(20) An ink composition according to claim 19, wherein the solvent is a hydrocarbon solvent.

- 25 (21) An ink composition according to any one of claims 14 to 20, wherein the concentration of the silicon compound in the composition is in a range of 0.01 to 10 percent by weight.

(22) An ink composition according to any one of claims 14 to 21, wherein the concentration has a viscosity of 1 to 50 mPa·s and a surface tension of 20 to 70 dyn/cm.

Add p57